

LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently amended) A controller ~~comprising a device having~~ comprising:
a body portion; and
~~four and only four arms extending from the body portion which is adapted to support the controller, the arms being spaced from one another in three dimensions and the device having six or more degrees of constraint, each arm having a tip portion~~[[s]];
four connection joints, each connection joint of each of the arms engaging one of the tip portions therein to in connection means providing restricted restrict relative motion of the four arms within the controller device, a sum of joints' constraints amounting to at least six;[[,]]
a gripping device attached to the connection means joints being attached to a gripping means, the gripping device being operable to which can receive and transmit any applied force and/or any applied torque in any of the [[a]] three dimensions; and dimensional sense, the controller including
a response detector operable detection means for monitoring responses to the applied force and applied torque in at least three of the four arms, the response detector being further operable to provide an output signal representative of a three-dimensional force and/or three dimensional the any force and any torque applied through the gripping device means.
2. (Currently amended) A controller device as defined in claim 1, wherein the response detector is operable detection means has means for directly monitoring response in three and only three of the four arms, and the controller device further comprises a calculator operable means for calculating from data representing the monitored response in the three arms the values of a response in the fourth arm from data representing monitored responses in the only three arms.
3. (Currently amended) A controller device as defined in claim 1, and further comprising a system connected to the response detector to receive the output signal and to be controlled.

4. (Currently amended) A controller device as defined in claim 1, wherein the arms are arranged in a tetrahedron shaped envelope and are almost equally mutually spaced in a symmetrical sense with a small degree of non-symmetry to provide pre-loading at the connection means.
5. (Currently amended) A controller device as defined in claim 1, ~~wherein the device has~~ further comprising a structure to provide eight degrees of constraint to the arms.
6. (Currently amended) A controller device as defined in claim 1, wherein the tip portion of each arm has a portion with a substantially part-spherical profile and each connection joint includes ~~is slidable along~~ a cylindrical bore having an axis ~~associated with the connection means,~~ each tip portion being slidable along the cylindrical bore of one of the connection joint and ~~the~~ each arm being is rotatable relative to the axis of the bore.
7. (Currently amended) A controller device as defined in claim 1, wherein ~~each of the~~ response detector ~~detection means~~ includes a plurality of optical sensors each of which has an emitter and a detector, the optical sensors being arranged substantially in ~~the~~ a same plane and each optical sensor having a respective optical axis ~~axes~~ transverse to ~~the~~ an axis of the associated arm.
8. (Currently amended) A controller device as defined in claim 7, ~~incorporating further~~ comprising a total of ~~[[6]]~~ six optical sensors disposed in pairs around three of the four arms.
9. (Currently amended) A controller device as defined in claim 1, and including a total of eight sensors provided in an array so that displacements in an X-Y set of responses for each of the four arms ~~is achieved giving results in eight readings which can be resolved to give~~ constituting the required output signal.
10. (Currently amended) A computer system comprising:
a controller device including
a body portion,

~~four and only four arms extending from [[a]] the body portion which is adapted to support the device, the arms being spaced from one another in three dimensions and the device having six or more degrees of constraint, each arm having a tip portion[[s]],~~

~~four connection joints, each connection joint of each of the arms engaging one of the tip portions therein to restrict in connection means providing restricted relative motion of the four arms within the controller device such that a sum of joints' constraints amounts to at least six,~~

~~a gripping device attached to the connection joints means being attached to a gripping means which can, the gripping device being operable to receive and transmit any applied force and/or any applied torque in any of the [[a]] three dimensions dimensional sense, and~~

~~a the device including response detector operable detection means for monitoring responses to the applied force and applied torque transmitted by the gripping device in at least three of the four arms, the monitored responses providing to provide an output signal representative of three-dimensional the applied force and/or the applied three dimensional torque applied to the gripping means, the output signal being operable arranged to control the computer system.~~

11. (Currently amended) A computer system as defined in claim 10, wherein the response ~~detection means has means for~~ detector is operable to directly monitor ~~monitoring response in three and only selected~~ three of the four arms, and the controller device further comprises a calculator operable means for calculating from data representing the monitored response in the three arms the values of a response in the fourth arm from data representing the monitored responses in the selected three arms.

12. (Currently amended) A computer system as defined in claim 10, wherein the arms are arranged in a tetrahedron shaped envelope and are almost equally mutually symmetrically spaced ~~in a symmetrical sense~~ with a small degree of non-symmetry to provide pre-loading at the connection joints means.

13. (Currently amended) A computer system as defined in claim 10, wherein the controller

device has a structure configured to provide eight degrees of constraint to the arms.

14. (Currently amended) A computer system as defined in claim 13, wherein the tip portion of each arm has a portion with a substantially part-spherical profile and each connection joint includes ~~is slidable along~~ a cylindrical bore having an axis associated with the connection means, each tip portion being slidable along the cylindrical bore of one of the connection joint and the each arm being is rotatable relative to the axis of the an associated bore.

15. (Currently amended) A computer system as defined in claim 10, wherein each of the response ~~detection means~~ detectors includes a plurality of optical sensors which are concentric and disposed on ~~the~~ a same plane.

16. (Currently amended) A computer system as defined in claim 15, ~~incorporating further~~ comprising a total of ~~[[6]]~~ six optical sensors disposed in pairs around three of the four arms.

17. (Currently amended) A controller device comprising:
a body portion;

~~four and~~ only four operative arms extending from ~~[[a]]~~ the body portion ~~which is adapted to support the controller, the arms being spaced from one another in three dimensions and the device having six or more degrees of constraint,~~ the four arms being arranged within a tetrahedron shaped envelope and are being equally mutually symmetrically spaced with a small degree of non-symmetry to provide pre-loading, each arm having a tip portion~~[[s]];~~

four connectors, each connector of each of the arms engaging one of the tip portions therein to form four joints of the controller device ~~connectors, the four joints restricting providing restricted~~ relative motion of the arms such that the four arms are constrained with a sum of joints' constraints being eight;

~~and being attached to~~ a hand grip attached to the four connectors, the hand grip being operable to ~~which can~~ receive and transmit to the arms any applied force and/or any applied torque in any of the ~~[[a]]~~ three dimensions; ~~dimensional sense, the controller including~~

response detectors operable for directly monitoring directly responses to the applied force and applied torque transmitted by the hand grip in at least three of the four arms to provide an

output signal representative of the applied ~~a three dimensional~~ force and/or ~~three dimensional~~, the applied torque applied to transmitted through the hand grip; and

~~the device further comprising means~~ a computer operable to register a for establishing the response in each of the four arms and to compute ~~for computing~~ the output signal[[,]]; and

~~the controller further comprising an output signal connector operable to connect the controller device for connection to a system to be controlled, and wherein the arms are arranged within a tetrahedron shaped envelope and are almost equally mutually spaced in a symmetrical sense with a small degree of non-symmetry to provide pre-loading at the connection means, and the arms are constrained such that the device has eight degrees of constraint.~~

18. (Currently amended) A computer system comprising:

~~having software for control by a spatial controller, and further comprising a spatial controller comprising~~ having

a body portion,

~~four and only four arms extending from [[a]] the body portion which is adapted to support the controller, the arms being spaced from one another in three dimensions, and the device having six or more degrees of constraint~~ the four arms being arranged within a tetrahedron shaped envelope and being equally mutually symmetrically spaced with a small degree of non-symmetry to provide pre-loading, each arm having a tip portion[[s]],

four connecting joints, each connecting joint of each of the arms engaging the tip portion of one of the arms therein, in connection means the four connecting joints restricting providing restricted relative motion of the arms and the sum of the joints' constraints amounting to eight,

a gripping device attached to the connection means joints, the gripping device being operable to being attached to a gripping means which can receive and transmit to the arms any applied force and/or any applied torque in any of the [[a]] three dimensions dimensional sense,

~~the controller including response detection detectors operable means for monitoring responses to the applied force and applied torque transmitted by the gripping device in three of the four arms to provide an output signal representative of a three dimensional the applied force and/or a three dimensional the applied torque applied~~

transmitted through to the gripping device, means and

the device further comprising means a computer operable to receive for
calculating from the monitored responses in the three arms from the response detectors
and to calculate the values a value of a response in the fourth arm[[,]]; and

a software embedded on a recording medium and including a set of instructions operable
to control the computer system in response to the output signal from the response detectors and
the value calculated by the computer

~~wherein the controller is arranged to control the computer system with the output signal,~~
~~and wherein the arms are arranged in a tetrahedron-shaped envelope and are almost equally~~
~~mutually spaced in a symmetrical sense with a small degree of non-symmetry to provide pre-~~
~~loading at the connection means, wherein the arms are constrained such that the device has eight~~
~~degrees of constraint.~~